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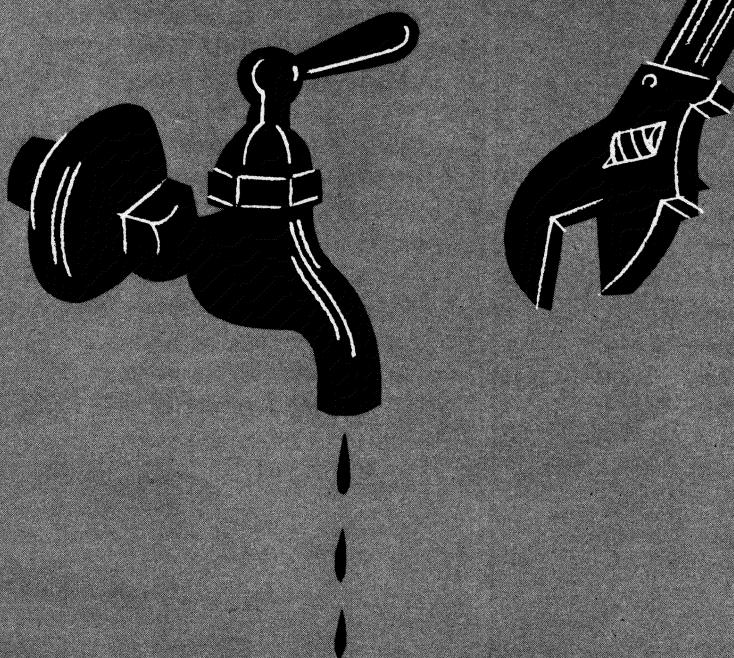
SIMPLE PLUMBING REPAIRS

■ for the Home
and Farmstead

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**Prepared by
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SIMPLE PLUMBING REPAIRS

■ for the Home and Farmstead

You can save money and avoid delays by making minor plumbing repairs yourself.

Jobs that a farmer or homeowner can do with a few basic tools include:

- Repairing water faucets and valves.
- Repairing leaks in pipes and tanks.
- Thawing frozen pipes.
- Repairing water closets.
- Cleaning clogged drains.

Extensive plumbing repairs or alterations in the plumbing system usually require authorization from local authorities and possibly inspection of the completed work. Therefore such work should be done by a qualified or licensed plumber.

REPAIRING WATER FAUCETS AND VALVES

Faucets and globe valves, the type of shutoff valves commonly used in home water systems, are very similar in construction (fig. 1) and repair instructions given below apply to both. Your faucets or valves may differ somewhat in general design from the one shown in figure 1, because both faucets and valves come in a wide variety of styles.

Mixing faucets, which are found on sinks, laundry trays, and bathtubs, are actually two separate units with a common spout. Each unit is independently repaired.

Dripping faucets are the most common plumbing problem. Normally a new washer is all that is required. If water leaks around the stem, either the packing is loose or needs replacing. To repair the faucet, first shut off the water at the shutoff valve nearest the particular faucet.

Disassemble the faucet by removing the handle, packing nut, packing, and stem in that order. You may have to set the handle back on the stem and use it to unscrew and remove the stem.

Remove the screw and worn washer from the stem. Clean the washer cup and install a new washer of the proper size and type.

Reassemble the faucet. Handles of mixing faucets should be in matched positions.

If a washer requires frequent replacement, it may be the wrong type or the seat may be rough and scoring the washer. Flat washers are used on seats having a crown or round ridge for the washer seat. Tapered or rounded washers are used with tapered seats. These seats may be replaced if worn or damaged.

Replaceable seats have either a square or hex shaped water passage for the seat removal tool. Seat dressing tools are available for non-replaceable seats.

Occasionally a faucet will be noisy when water is flowing. This may be due to a loose washer or worn threads on the stem and re-

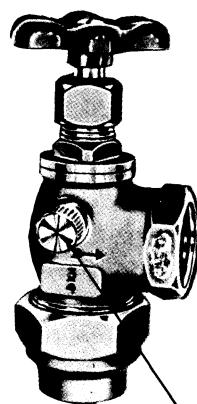
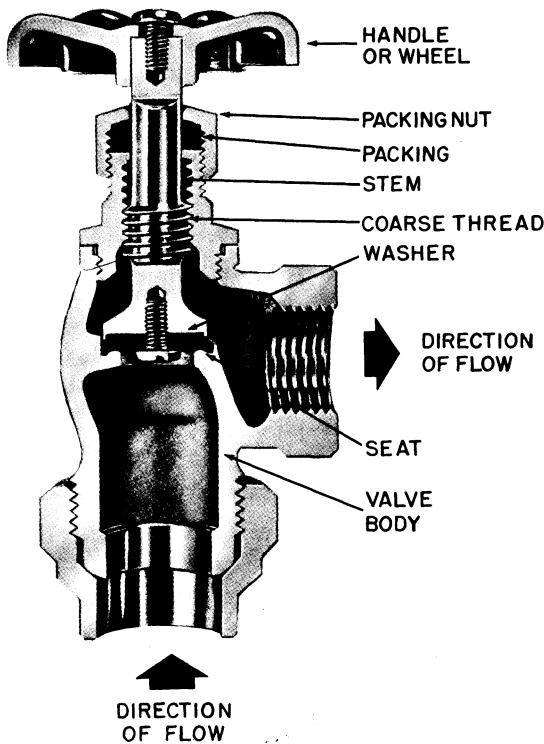


Figure 1.—Globe type angle valve. Faucets are similar in construction.

ceiver, permitting the stem to vibrate or chatter. Pressing down on the handle will stop stem vibration but will not affect a loose washer.

Replacement stems are available; however, if the receiving threads are worn excessively a new stem would not eliminate the problem completely. In some faucets it is possible to replace the stem receiver, the stem, and the seat, thus restoring all normal wearing parts within the faucet.

Several new faucet designs aimed at easier operation, eliminating drip, and promoting long service life, are on the market. Instructions for repair may be obtained from dealers.

If a shower head drips, the supply valve has not been ful-

ly closed, or the valve needs repair.

After extended use and several repairs, some valves will no longer give tight shutoff and must be replaced. When this becomes necessary, it may be advisable to upgrade the quality with equipment having better flow characteristics and longer-life design and materials. In some cases, ball valves will deliver more water than globe valves. Some globe valves deliver more flow than others for identical pipe sizes. Y-pattern globe valves, in straight runs of pipe, have better flow characteristics than straight stop valves. Figure 2 shows the features of different types of valves.

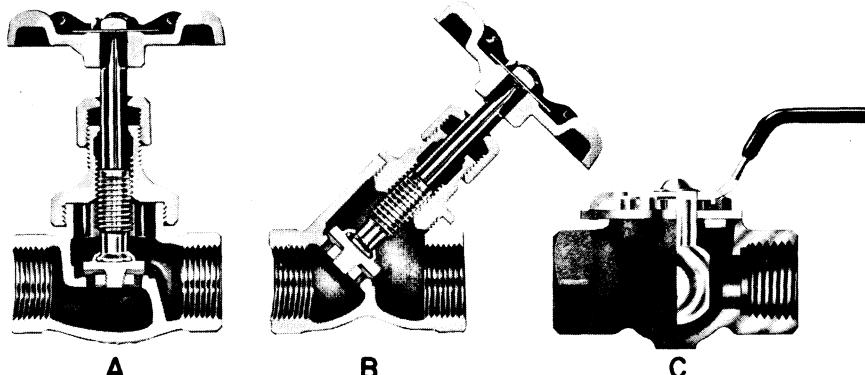


Figure 2.—Different types of valves: A, Glove valve; note large passages of water. B, Y-pattern globe valve; the flow is almost straight. C, Ball valve, straight flow; some makes are available with the port in the ball the same diameter as the pipe.

PRECAUTIONS

Polluted water or sewage may carry such diseases as typhoid fever and amoebic dysentery. If you do your own plumbing work, be sure that—

- There are no leaks in drain-pipes through which sewage or sewage gases can escape.
- There are no cross connections between piping carrying water from different sources unless there can be reasonable certainty that all sources are safe and will remain safe.
- There can be no back siphonage of water from plumbing fixtures or other containers into the water-supply system.

Once a pipe has become polluted, it may be difficult to free it of the pollution. For this reason, building codes do not permit the use of second-hand pipe. All ini-

tial piping and parts and subsequent replacements should be new.

Since a plumbing system will require service from time to time, shutoff valves should be installed at strategic locations so that an affected portion can be isolated (water flow to it cut off) with minimum disturbance to service in the rest of the system. Shutoff valves are usually provided on the water closet supply line, on the hot- and cold-water supply line to each sink, tub, and lavatory, and on the water heater supply line. Drain valves are usually installed for water-supply piping systems and for hot-water storage tanks.

A pressure-relief valve should be installed for the water heater storage tank to relieve pressure buildup in case of overheating.

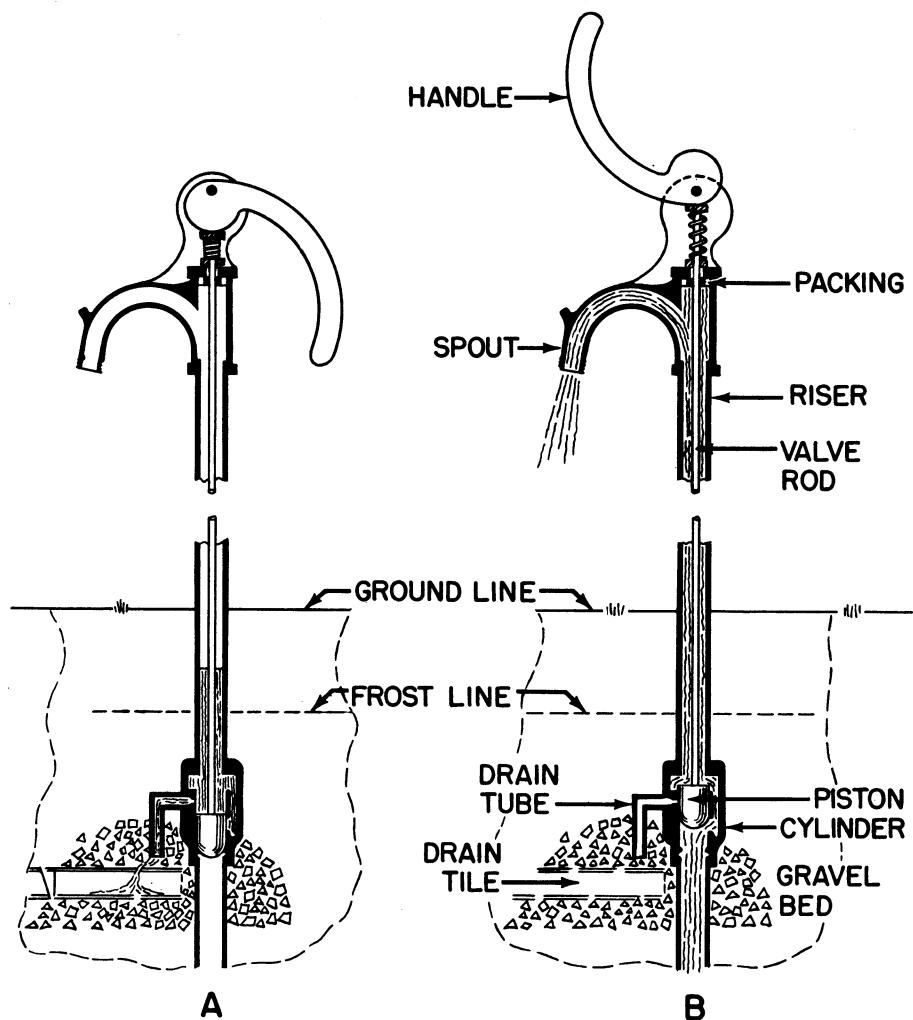


Figure 3.—Frostproof hydrant; A, Closed; B, opened. As soon as the hydrant is closed, water left in the riser drains out the drain tube as shown in A. This prevents water from freezing in the hydrant in cold weather.

FROSTPROOF HYDRANTS

Frostproof hydrants are basically faucets, although they may differ somewhat in design from ordinary faucets.

Two important features of a frostproof hydrant are: (1) The valve is installed under ground—below the frostline—to prevent

freezing, and (2) the valve is designed to drain the water from the hydrant when the valve is closed.

Figure 3 shows one type of frostproof hydrant. It works as follows: When the handle is raised, the piston rises, opening the valve. Water flows from the supply pipe into the cylinder, up

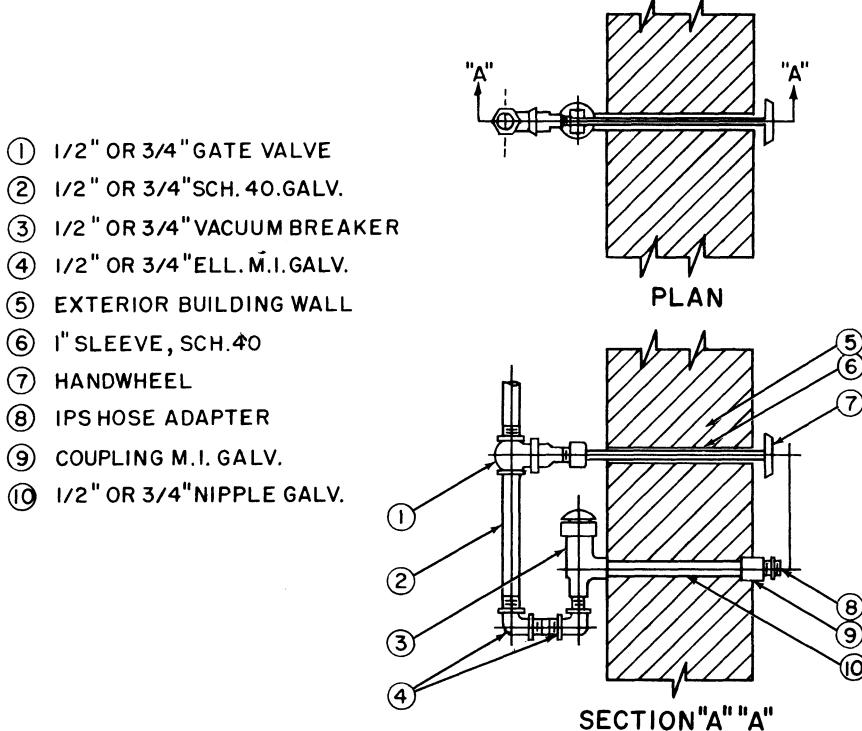


Figure 4.—Vacuum breaker arrangement for outside hose hydrant.

through the riser, and out the spout. When the handle is pushed down, the piston goes down, closing the valve and stopping the flow of water. Water left in the hydrant flows out the drain tube into a small gravel-filled dry well or drain pit.

As with ordinary faucets, leakage will probably be the most common trouble encountered with frostproof hydrants. Worn packing, gaskets, and washers can cause leakage. Disassemble the hydrant as necessary to replace or repair these and other parts.

Frostproof yard hydrants having buried drains can be health hazards. The vacuum created by

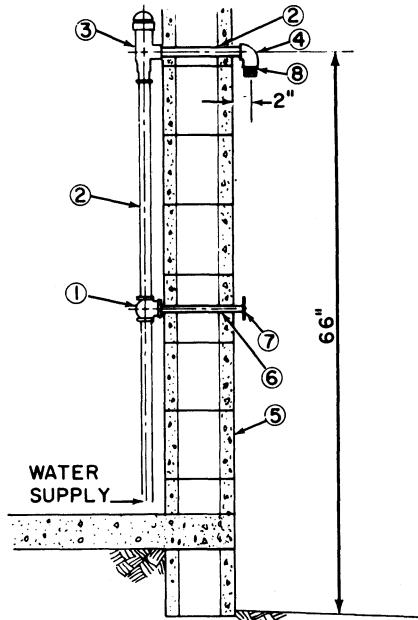
water flowing from the hydrant may draw in contaminated water standing above the hydrant drain level. Such hydrants should be used only where positive drainage can be provided.

Frostproof wall hydrants (fig. 4) are the preferred type. For servicing sprayers using hazardous chemicals, hydrants having backflow protection should be used (fig. 5).

REPAIRING LEAKS IN PIPES AND TANKS

Pipes

Leaks in pipes usually result from corrosion or from damage to the pipe. Pipes may be dam-



- ① $\frac{3}{4}$ " BALL OR GATE VALVE
- ② $\frac{3}{4}$ " PIPE, GALV.
- ③ $\frac{3}{4}$ " VACUUM BREAKER
- ④ $\frac{3}{4}$ " ELL. M.I. GALV.
- ⑤ EXTERIOR BUILDING WALL
- ⑥ 1" SLEEVE
- ⑦ VALVE HANDLE
- ⑧ HOSE ADAPTER

Figure 5.—Protected wall hydrant suitable for filling agricultural sprayers.

aged by freezing, by vibration caused by machinery operating nearby, by water hammer, or by animals bumping into the pipe. (Water hammer is discussed on p. 8)

Corrosion

Occasionally waters are encountered that corrode metal pipe and tubing. (Some acid soils also corrode metal pipe and tubing.)

The corrosion usually occurs, in varying degrees, along the entire

length of pipe rather than at some particular point. An exception would be where dissimilar metals, such as copper and steel, are joined.

Treatment of the water may solve the problem of corrosion.¹ Otherwise, you may have to replace the piping with a type made of material that will be less subject to the corrosive action of the water.

It is good practice to get a chemical analysis of the water before selecting materials for a plumbing system. Your State college or university may be equipped to make an analysis; if not, you can have it done by a private laboratory.

Repairing Leaks

Pipes that are split by hard freezing must be replaced.

A leak at a threaded connection can often be stopped by unscrewing the fitting and applying a pipe joint compound that will seal the joint when the fitting is screwed back together.

Small leaks in a pipe can often be repaired with a rubber patch and metal clamp or sleeve. This must be considered as an emergency repair job and should be followed by permanent repair as soon as practicable.

¹ For information about water treatment, see FB 2248, "Treating Farmstead and Rural Home Water Systems." You can get a free copy from your county agricultural agent or write the Office of Information, U.S. Department of Agriculture, Washington, D.C. 20250. Include your ZIP Code in your return address.

Large leaks in a pipe may require cutting out the damaged section and installing a new piece of pipe. At least one union will be required unless the leak is near the end of the pipe. You can make a temporary repair with plastic or rubber tubing. The tubing must be strong enough to withstand the normal water pressure in the pipe. It should be slipped over the open ends of the piping and fastened with pipe clamps or several turns of wire.

Vibration sometimes breaks solder joints in copper tubing, causing leaks. If the joint is accessible, clean and resolder it. The tubing must be dry before it can be heated to soldering temperature. Leaks in places not readily accessible usually require the services of a plumber and sometimes of both a plumber and a carpenter.

Tanks

Leaks in tanks are usually caused by corrosion. Sometimes, a safety valve may fail to open and the pressure developed will spring a leak.

While a leak may occur at only one place in the tank wall, the wall may also be corroded thin in other places. Therefore, any repair should be considered as temporary, and the tank should be replaced as soon as possible.

A leak can be temporarily repaired with a toggle bolt, rubber gasket, and brass washer, as shown in figure 6. You may have to drill or ream the hole larger to insert the toggle bolt. Draw the bolt up tight to compress the rubber gasket against the tank wall.

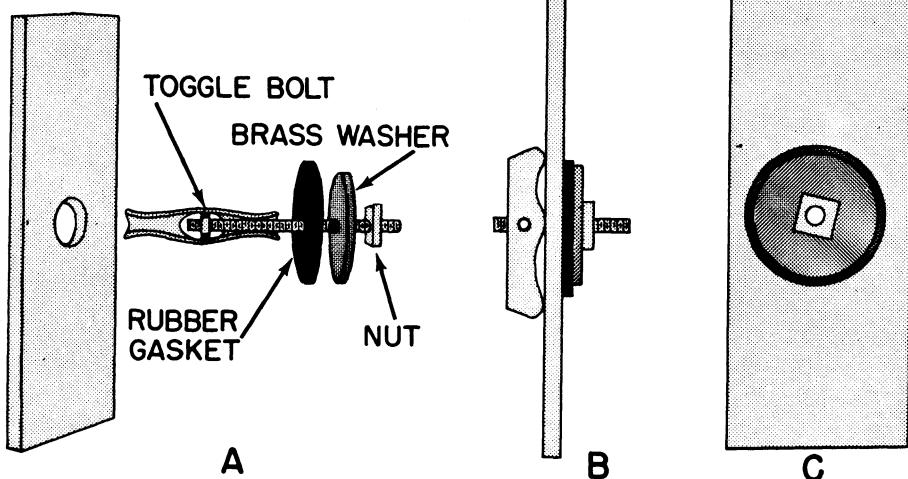


Figure 6.—Closing a hole in a tank: A, The link of the toggle bolt is passed through the hole in the tank (hole is enlarged if necessary). B, Side view of tank edge (nut is drawn up tightly to compress washer and gasket against tank). C, Outside view of completed repair.

WATER HAMMER

Water hammer sometimes occurs when a faucet is suddenly closed. When the flow of water is suddenly stopped, its kinetic energy is expended against the walls of the piping. This causes the piping to vibrate, and leaks or other damage may result.

Water hammer may be prevented or its severity reduced by installing an air chamber just ahead of the faucet. The air chamber may be a piece of air-filled pipe or tubing, about 2 feet long, extending vertically from the pipe. It must be airtight. Commercial devices designed to prevent water hammer are also available.

An air chamber requires occasional replenishing of the air to prevent it from becoming water-logged—that is, full of water instead of air.

A properly operating hydro-pneumatic tank, such as the type used in individual water systems, serves as an air chamber, preventing or reducing water hammer.

FROZEN WATER PIPES

In cold weather, water may freeze in underground pipes laid above the frostline or in pipes in unheated buildings, in open crawl spaces under buildings, or in outside walls.

When water freezes it expands. Unless a pipe can also expand, it may rupture when the water freezes. Iron pipe and steel pipe

do not expand appreciably. Copper pipe will stretch some, but does not resume its original dimensions when thawed out; repeated freezings will cause it to fail eventually. Flexible plastic tubing can stand repeated freezes, but it is good practice to prevent it from freezing.

Preventing Freezing

Pipes may be insulated to prevent freezing, but this is not a completely dependable method. Insulation does not stop the loss of heat from the pipe—merely slows it down—and the water may freeze if it stands in the pipe long enough at below-freezing temperature. Also, if the insulation becomes wet, it may lose its effectiveness.

Electric heating cable can be used to prevent pipes from freezing. The cable should be wrapped around the pipe and covered with insulation.

Thawing

Use of electric heating cable is a good method of thawing frozen pipe, because the entire heated length of the pipe is thawed at one time.

Thawing pipe with a blowtorch can be dangerous. The water may get hot enough at the point where the torch is applied to generate sufficient steam under pressure to rupture the pipe. Steam from the break could severely scald you.

Thawing pipe with hot water

is safer than thawing with a blowtorch. One method is to cover the pipe with rags and then pour the hot water over the rags.

When thawing pipe with a blowtorch, hot water, or similar methods, open a faucet and start thawing at that point. The open faucet will permit steam to escape, thus reducing the chance of the buildup of dangerous pressure. Do not allow the steam to condense and refreeze before it reaches the faucet.

Underground metal pipes can be thawed by passing a low-voltage electric current through them. The current will heat the entire length of pipe through which it passes. Both ends of the pipe must be open to prevent the buildup of steam pressure.

CAUTION: This method of thawing frozen pipe can be dangerous and should be done by an experienced person only. It cannot be used to thaw plastic tubing or other non-electricity-conducting pipe or tubing.

REPAIRING WATER CLOSETS

Water closets (commonly called toilets) vary in general design and in the design of the flushing mechanism. But they are enough alike that general repair instructions can suffice for all designs.

Flushing Mechanism

Figure 7 shows a common type of flushing mechanism. Parts that usually require repair are the

flush valve, the intake (float) valve, and the float ball.

In areas of corrosive water, the usual copper flushing mechanism may deteriorate in a comparatively short time. In such cases, it may be advisable to replace the corroded parts with plastic parts. You can even buy plastic float balls.

Flush Valve

The rubber ball of the flush valve may get soft or out of shape and fail to seat properly. This causes the valve to leak. Unscrew the ball from the lift wire and install a new one.

The trip lever or lift wire may corrode and fail to work smoothly, or the lift wire may bind in the guides. Disassemble and clean off corrosion or replace parts as necessary.

Most plumbing codes require a cutoff valve in the supply line to the flush tank, which makes it unnecessary to close down the whole system (fig. 7). If this valve was not installed, you can stop the flow of water by propping up the float with a piece of wood. Be careful not to bend the float rod out of alignment.

Intake (Float) Valve

A worn plunger washer in the supply valve will cause the valve to leak. To replace the washer—

- Shut off the water and drain the tank.
- Unscrew the two thumbscrews that hold the levers and push out the levers.

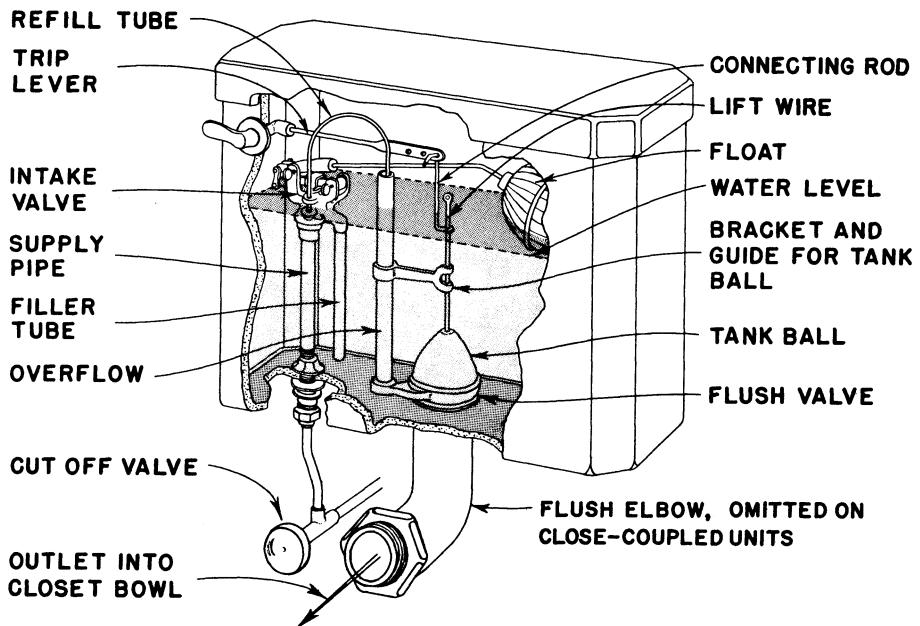


Figure 7.—Water closet (toilet) flush tank.

- Lift out the plunger, unscrew the cup on the bottom, and insert a new washer. The washer is made of material such as rubber or leather.

- Examine the washer seat. If nicked or rough, it may need refacing.

If the float-valve assembly is badly corroded, replace it.

Float Ball

The float ball may develop a leak and fail to rise to the proper position. (Correct water level is about 1 inch below the top of the overflow tube or enough to give a good flush.) If the ball fails to rise, the intake valve will remain open and water will continue to flow. Brass float balls can sometimes be drained and the leak soldered. Other types must

be replaced. When working on the float ball, be careful to keep the rod aligned so that the ball will float freely and close the valve properly.

Bowl Removal

An obstruction in the water closet trap or leakage around the bottom of the water-closet bowl may require removal of the bowl. Follow this procedure:

- Shut off the water.
- Empty the tank and bowl by siphoning or sponging out the water.
- Disconnect the water pipes to the tank (see fig. 7).
- Disconnect the tank from the bowl if the water closet is a two-piece unit. Set the tank where it cannot be damaged. Handle tank and bowl carefully;

they are made of vitreous china or porcelain and are easily chipped or broken.

- Remove the seat and cover from the bowl.

- Carefully pry loose the bolt covers and remove the bolts holding the bowl to the floor flange (fig. 8). Jar the bowl enough to break the seal at the bottom. Set the bowl upside down on something that will not chip or break it.

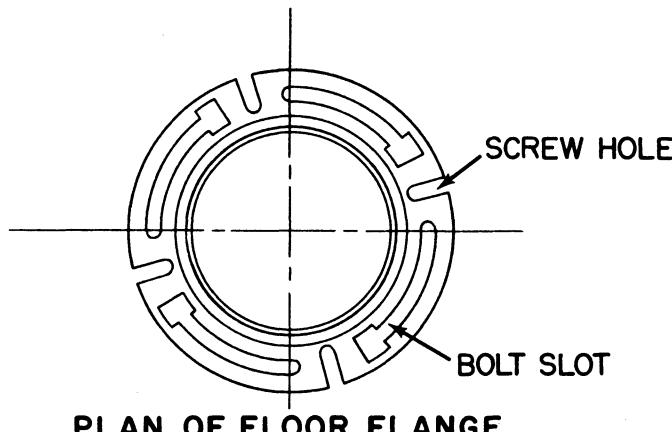
- Remove the obstruction from the discharge opening.

- Place a new wax seal around the bowl horn and press it into

place. A wax seal (or gasket) may be obtained from hardware or plumbing-supply stores.

- Set the bowl in place and press it down firmly. Install the bolts that hold it to the floor flange. Draw the bolts up snugly, but not too tight because the bowl may break. The bowl must be level. Keep a carpenter's level on it while drawing up the bolts. If the house has settled, leaving the floor sloping, it may be necessary to use shims to make the bowl set level. Replace the bolt covers.

- Install the tank and con-



PLAN OF FLOOR FLANGE

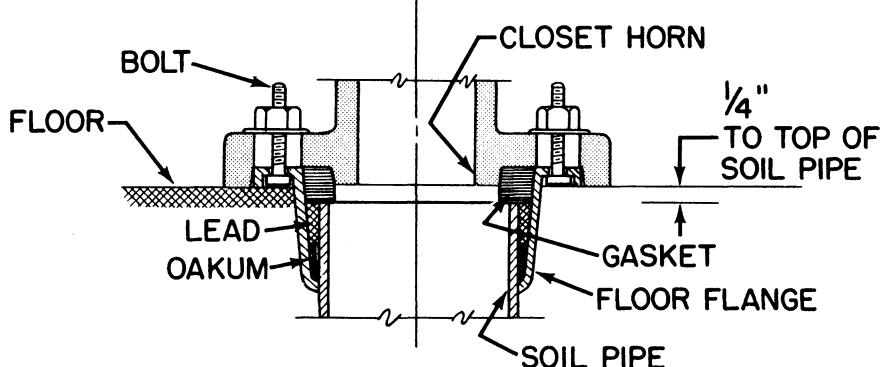


Figure 8.—Connection of water closet to floor and soil pipe.

nect the water pipes to it. It is advisable to replace all gaskets, after first cleaning the surfaces thoroughly.

- Test for leaks by flushing a few times.
- Install the seat and cover.

Tank "Sweating"

When cold water enters a water closet tank, it may chill the tank enough to cause "sweating" (condensation of atmospheric moisture on the outer surface of the tank). This can be prevented by insulating the tank to keep the temperature of the outer surface above the dew point temperature of surrounding air. Insulating jackets or liners that fit inside water-closet tanks and serve to keep the outer surface warm are available from plumbing-supply dealers.

CLEARING CLOGGED DRAINS

Drains may become clogged by objects dropped into them or by accumulations of grease, dirt, or other matter.

Fixture and Floor Drains

If the obstruction is in a fixture trap, usually the trap can be removed and cleared. If the obstruction is elsewhere in the pipe other means must be used.

Cleanout augers—long, flexible, steel cables commonly called "snakes"—may be run down drainpipes to break up obstruc-

tions or to hook onto and pull out objects. Augers are made in various lengths and diameters and are available at hardware and plumbing-supply stores. (In some cases, you may have to call a plumber, who will probably have a power-driven auger.)

Small obstructions can sometimes be forced down or drawn up by use of an ordinary rubber force cup (plunger or "plumber's friend").

Grease and soap clinging to a pipe can sometimes be removed by flushing with hot water. Lye or lye mixed with a small amount of aluminum shavings may also be used. When water is added to the mixture, the violent gas-forming reaction and production of heat that takes place loosens the grease and soap so that they can be flushed away. *Use cold water only.* Chemical cleaners should not be used in pipes that are completely stopped up, because they must be brought into direct contact with the stoppage to be effective. Handle the material with extreme care and follow directions on the container. If lye spills on the hands or clothing, wash with cold water immediately. If any gets into the eyes, flush with cold water and call a doctor.

Sand, dirt, or clothing lint sometimes clogs floor drains. Remove the strainer and ladle out as much of the sediment as possible. You may have to carefully chip away the concrete around the strainer to free it. Flush the drain with clean water.

When drains have become partially clogged due to lack of water to transport all solids through them, large buckets or other containers should be used to flush them. Water should be poured fast enough to nearly fill the drain.

Occasional flushing of floor drains may prevent clogging.

CAUTION: Augers, rubber force cups, and other tools used in direct contact with sewage are subject to contamination. Do not later use them for work on your potable water supply system unless they have been properly sterilized.

Outside Drains

Roots growing through cracks or defective joints sometimes clog outside drains or sewers. You can clear the stoppage temporarily by using a root-cutting tool. However, to prevent future trouble, you should re-lay the defective portion of the line, using sound pipe and making sure that all joints are watertight.²

If possible, sewer lines should be laid out of the reach of roots. But if this is impossible or impracticable, consider using impregnated fiber pipe which tends to repel roots.

² For information on laying sewers, see Agriculture Information Bulletin 274, "Farmstead Sewage and Refuse Disposal." For a free copy, send a post card to the Office of Information, U.S. Department of Agriculture, Washington, D.C. 20250. Include your ZIP Code in your return address.

TOOLS AND SPARE PARTS

Basic tools that you should have on hand to make simple plumbing repairs include:

Wrenches, including pipe wrenches, in a range of sizes to fit the pipe, fittings, fixtures, equipment, and appliances in the system.

Screwdrivers in a range of sizes to fit the faucets, valves, and other parts of the system.

Ball peen hammer or a 12- or 16-ounce clawhammer.

Rubber force cup (plunger or "plumber's friend").

Cold chisel and center punch.

Cleanout auger ("snake").

Friction tape.

Adjustable pliers.

Additional tools required for more extensive plumbing repairs include:

Pipe vise.

Set of pipe threading dies and stocks.

Hacksaw and blades (blades should have 32 teeth per inch).

Pipe cutter, roller type.

Tapered reamer or half-round file.

Carpenter's brace.

Set of wood bits.

Gasoline blowtorch.

Lead pot and ladle.

Calking tools.

Copper tube cutter with reamer (if you have copper tubing).

Always use the proper size wrench or screwdriver. Do not use pipe wrenches on nuts with flat surfaces; use an adjustable or open-end wrench. Do not use pipe wrenches on polished-surface tubings or fittings, such as found on plumbing fixtures; use a strap wrench. Tight nuts or fittings can sometimes be loosened by tapping lightly with a hammer or mallet.

It should not be necessary to stock a large number of spare parts. Past plumbing troubles may give some indication as to the kind of parts most likely to be needed. Spare parts should include:

Faucet washers and packing.

One or two lengths of the most common type and size of piping in the plumbing system.

Several unions and gaskets or unions with ground surfaces.

Several couplings and elbows.

A few feet of pipe strap.

An extra hose connection.

EMERGENCIES

Grouped below are emergencies that may occur and the action to take. The name, address, and phone number of a plumber who offers 24-hour service should be posted in a conspicuous place.

Burst pipe or tank.—Immediately cut off the flow of water by closing the shutoff valve nearest to the break. Then arrange for repair.

Water closet overflow.—Do not use water closet until back in working order. Check for and remove stoppage in closet bowl outlet, drain line from closet to sewer, or sewer or septic tank. If stoppage is due to root entry into pipe, repair of pipe at that point is recommended.

Rumbling noise in hot water tank.—This is likely a sign of overheating which could lead to the development of explosive pressure (Another indication of overheating is hot water backing up in the cold-water supply pipe.) Cut off the burner immediately. Be sure that the pressure-relief valve is operative. Then check (with a thermometer) the temperature of the water at the nearest outlet. If above that for which the gage is set, check the thermostat that controls burner cut-off. If you cannot correct the trouble, call a plumber.

Cold house.—If the heating system fails (or if you close the house and turn off the heat) when there is a chance of sub-freezing weather, completely drain the plumbing system. A drain valve is usually provided at the low point of the water supply piping for this purpose. A pump, storage tank, hot-water tank, water closet tank, water-treatment apparatus, and other water-system appliances or accessories should also be drained. Put antifreeze in all fixture and drain traps.

Hot-water and steam heating systems should also be drained when the house temperature may drop below freezing.